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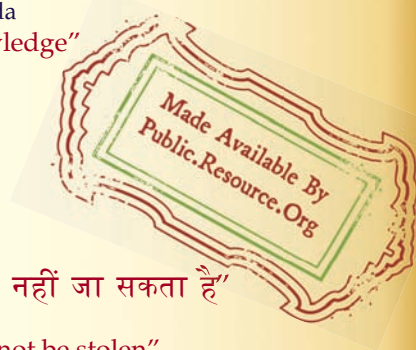
IS 8824-1 (1978): Electrical moisture meters, Part 1: For food grains [ETD 18: Industrial Process Measurement and Control]



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“Knowledge is such a treasure which cannot be stolen”

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IS : 8824 (Part 1) - 1978

Indian Standard
SPECIFICATION FOR
ELECTRICAL MOISTURE METERS
PART I FOR FOODGRAINS

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TO

IS:8824(Part I)-1978 'SPECIFICATION FOR ELECTRICAL
MOISTURE METERS

PART I FOR FOODGRAINS

Alteration

(Page 8, clause 11.5, Note) - Substitute the
following for the existing note:

'NOTE - The tests 11.4 and 11.5 shall not be
applicable to such type of moisture meters where
the steel plunger of the compression unit becomes
one electrode and is directly connected to the
metallic casing.'

(ETDC 67)

Reprography Unit, ISI, New Delhi, India

Indian Standard
SPECIFICATION FOR
ELECTRICAL MOISTURE METERS
PART I FOR FOODGRAINS

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Indian Standard
SPECIFICATION FOR
ELECTRICAL MOISTURE METERS
PART I FOR FOODGRAINS

0. FOREWORD

0.1 This Indian Standard (Part I) was adopted by the Indian Standards Institution on 26 June 1978, after the draft finalized by the Electrical Instruments for Industrial Processes Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 Electrical moisture meters are a direct, quick, convenient and non-destructive means of determining the moisture content. Electrical moisture meters are commonly used for determination of moisture content of materials, such as foodgrains, cereals, oil seeds and pulses. Variety of designs of reliable instruments are available for making spot tests of these materials. On the other hand, the field of continuous moisture measurement has been confined largely to textile and paper products.

0.3 Electrical moisture meters are of two types based on the working principles, namely, conductivity type meters (resistance meters) and capacitance type meters. Conductivity meters are most commonly used for the determination of moisture content in the range of 6 to 40 percent for making spot measurements. However, where moisture contents below 25 percent and continuous measurement and control may be involved, the capacitance meters are employed.

0.4 In view of the fact that there are several aspects of moisture meters, like constructional features, electrode system, etc, which are different depending upon the end use, such as for foodgrains, soil, wood, oil, etc; this standard is being brought out in different parts. This standard for foodgrains application forms Part I of the series; other parts are under preparation.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values (*revised*).

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1. SCOPE

1.1 This standard (Part I) specifies the requirements and tests for mains-operated and battery-operated electrical moisture meters used for the determination of moisture content of foodgrains, such as cereals, pulses, oil seeds, and other granular materials like coffee beans, cotton seeds and oats.

2. TYPES

2.1 Depending upon the operating principles, the electrical moisture meters shall be one of the following types:

Type 1 Conductivity meters (dc)

Type 2 Capacitance meters (ac)

3. OPERATING PRINCIPLES

3.1 Conductivity Meters — This meter works on the principle that electrical conductivity of the material under test is proportional to the amount of moisture contained in it. Moisture is determined by the measurement of electrical resistance of the sample when it is held in an electrode vessel.

3.2 Capacitance Meter — The basic operating principle of the capacitance meter is based on the change occurring in the dielectric constant of a material between its moist and dry condition. Moisture is determined by the measure of capacitance of the sample.

4. CONSTRUCTIONAL FEATURES

4.1 Compression Unit — The compression unit is employed to compress the material to a particular thickness (to bring it to a uniform state and to minimize the porosity effect on the electrical conductivity) placed under the steel plunger and an insulated test cup, both of which act as electrodes. A constant mass of the material is taken and a particular pressure is specified for all types of material and different charts are provided for different material. It is provided with a vertically mounted scale coupled with a micrometer scale for accurate measurement of desired thickness-setting of the material.

4.2 Electrodes — Method of presenting the sample of material under test varies with the type of product and the type of meter employed. Conductivity meters have electrodes which make physical contact with the material, while capacitance meters may not require physical contact with either electrode.

4.3 Electrical Unit — The circuitry consists of a bridge balancing technique employing suitable electrical/electronic circuitry. The whole electrical/electronic circuitry shall be housed in a specially designed box fitted to the base of the meter. The necessary supply (in case of battery-operated meters) for the electrical/electronic circuitry shall also be housed in the box.

4.4 Typical Arrangement — A typical arrangement of moisture meter is shown in Fig. 1.

5. GENERAL REQUIREMENTS

5.1 General — Moisture meters shall be sturdy and compact.

5.2 Temperature Compensation — Moisture meters shall have a built-in temperature compensation circuit to avoid the error due to temperature change, or calibration charts shall be provided along with the meters when temperature compensation is not provided.

5.3 Calibration Check-Up — The moisture meter shall be provided with an arrangement to check up the calibration of the meter, as and when desired.

5.4 Scale — Moisture meters shall have a suitably graduated scale to indicate percentage of moisture content directly. Alternatively, calibration charts may be provided.

5.5 Supply Voltage — The meter shall be designed for operation from a dc source of 24 V (*Max*), or from ac mains supply of 240 ± 6 percent V at 50 ± 3 percent Hz.

5.6 Accessories — The required accessories for operating the moisture meter including the compression unit and the electrodes shall be provided along with the meter.

5.7 Carrying Case — The meter shall be provided with a suitable carrying case. It shall also accommodate all the accessories.

6. ACCURACY

6.1 The accuracy of the moisture meters at $27 \pm 2^\circ\text{C}$ shall be declared by the manufacturer.

7. MEASURING RANGE

7.1 The measuring range shall be from 8 to 40 percent.

8. OPERATING TEMPERATURE RANGE

8.1 The moisture meter shall be so designed as to perform satisfactorily from 0 to 55°C continuously and at a maximum humidity of 95 percent.

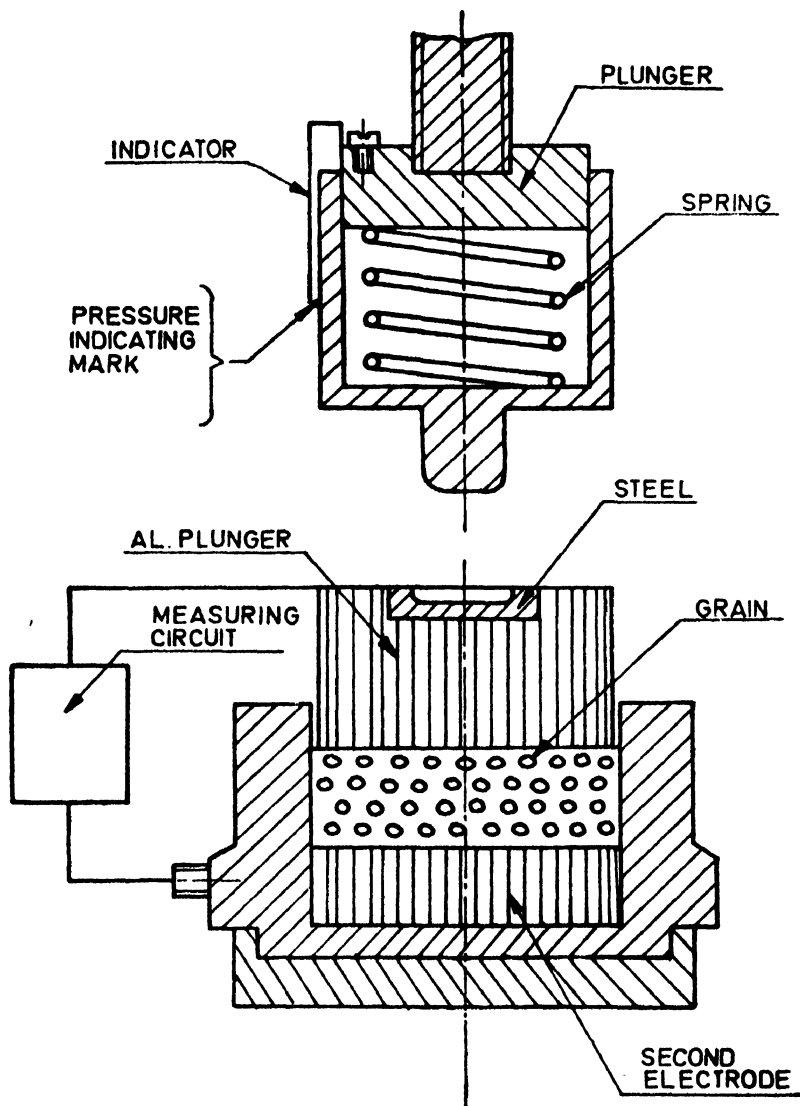


FIG. 1 TYPICAL ARRANGEMENT OF GRAIN MOISTURE METER

9. OPERATING INSTRUCTIONS

9.1 The manufacturer shall provide all the necessary precautions and operating instructions, preferably on the meter casing.

10. PACKING AND MARKING

10.1 Packing — Moisture meter shall be packed in wooden or other suitable container in which it could conveniently be carried in the field.

10.2 Marking — The scale plate of the moisture meter shall be clearly and indelibly marked with the following information:

- a) Manufacturer's name or trade-mark,
- b) Type of meter,
- c) Accuracy class,
- d) Supply voltage, and
- e) Country of manufacture.

10.2.1 The moisture meter may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

10.3 The manufacturer shall supply a suitable leaflet containing the precautions to be observed in the use of electrical moisture meters.

11. TESTS

11.0 General Conditions for Tests — Unless otherwise specified, all the tests shall be carried out under the following conditions:

Temperature	15 to 35°C
Relative humidity	45 to 75 percent
Pressure	86 to 106 kPa

11.1 Type Tests — The following shall constitute type tests:

- a) Insulation resistance test (**11.4**),
- b) High voltage test (**11.5**), and
- c) Calibration test (**11.6**).

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11.1.1 Samples for Type Tests — Type tests shall be applied to three test specimens; in the event of any one specimen failing to comply with the requirements in any respect, a further set of three specimens shall be taken, all of which shall comply with the requirements of the standard.

11.2 Acceptance Tests — Under consideration.

11.3 Routine Tests — The following shall constitute routine tests:

- a) Insulation resistance test (11.4),
- b) High voltage test (11.5), and
- c) Calibration test (11.6).

11.4 Insulation Resistance Test — The insulation resistance between the two electrodes connected together and the metallic casing (or accessible metal parts connected together, if casing is not wholly metallic), when measured at 500 ± 50 V dc applied for a minimum of one minute of electrification shall be not less than 10 megohms.

11.5 High Voltage Test — For mains-operated moisture meters, no breakdown, arcing or sparking shall occur when an ac voltage of 1 500 V (rms) is applied across the two electrodes connected together and the metallic casing (or accessible metal parts connected together, if casing is not wholly metallic) for one minute.

NOTE—In such cases where the steel plunger of the compression unit becomes one electrode and is directly connected to the metallic casing, tests 11.4 and 11.5 shall be done by applying the test voltage between the other electrode and the metal casing.

11.6 Calibration Test — The calibration shall be done against the standard oven method. The moisture meter shall be calibrated for a product temperature of $27 \pm 2^\circ\text{C}$ and relative humidity of 65 ± 5 percent.

NOTE — At temperatures other than that of the calibration, either correction has to be applied, or temperature compensation circuits have to be built in the meter. In case correction is necessary, proper calibration charts may be provided (*see also* 5.2).

12. REPRODUCIBILITY OF TEST RESULTS

12.1 The reproducibility of the test results shall be within 2 percent of the reading.